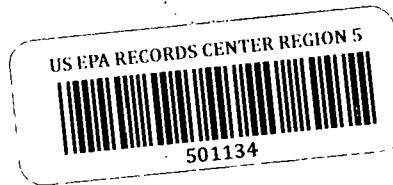


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December 1, 2009

Mr. James Hahnenberg
Remedial Project Manager
U.S. Environmental Protection Agency, Region 5
77 West Jackson Boulevard, SR-6J
Chicago, IL 60604-3590

Re: Revisions and Clarifications
County Drain #30 Sediment and Soil Sampling Work Plan
North Bronson Industrial Area Site Operable Unit 1, Bronson, Michigan

Dear Mr. Hahnenberg:

This correspondence, prepared on behalf of the North Bronson Industrial Area (NBIA) Potentially Responsible Parties Group (the Group), provides follow-up to the conference call discussion of November 6, 2009 among representatives of the U.S. Environmental Protection Agency (EPA), the Michigan Department of Environmental Quality (MDEQ), and the Group regarding the County Drain #30 (CD#30) Sediment and Soil Sampling Work Plan. In that discussion, we reviewed the sampling plan submitted by the Group to EPA on February 27, 2009 (the "Work Plan"), the MDEQ comments provided by letter dated August 11, 2009, and the Group's response letter of September 14, 2009. This letter addresses the issues identified in the call for which EPA and MDEQ requested additional information.

OBJECTIVES OF SAMPLING

The objectives of the proposed sediment and soil sampling are defined in the Work Plan. As discussed, this sampling effort is intended to provide a basis for scoping the Remedial Design and provide current data regarding the extent of impacted materials exceeding the proposed remedial criteria for sediment and erodible soil and for non-erodible soils. The sampling plan is based on pragmatic approaches to sediment and soil remediation at the NBIA Site, including the proposed plan to consolidate removed CD#30 sediments and associated soils into the closure area at the Western Lagoons. The Group recognizes that, depending on the outcome of this study, additional sampling may be needed, especially with respect to the extent of non-erodible soils in the right-of-way on the north side of CD#30, and does not

assume that this sampling effort will preempt the need for post-removal confirmatory sampling as part of the Remedial Action.

SAMPLING TRANSECTS AND LOCATIONS

The attached Figure 1 has been revised to include a cross-section that shows the locations of samples associated with each of the seven proposed transects (*i.e.*, SD-28 through SD-35). Figure 1 also shows the transect locations in plan view.

As shown in the cross-section, and as recommended by MDEQ, the samples to the north of CD#30 have been moved to standard distances of 10 and 30 feet north of CD#30 (rather than 5 and 20 feet as previously proposed), and an additional sampling point will be located 70 feet north of CD#30 in an effort to delineate the northern extreme of impacted soils. At each sampling location, samples will be collected from 0- to 6-inch and 12- to 18-inch depth increments.

As shown in Figure 1, the location of sampling transects SD-29, SD-31, and SD-32 have been adjusted as follows, based on MDEQ's recommendations:

- SD-29: relocated approximately 50 feet to the west to avoid the former wooded area;
- SD-31: relocated approximately 120 feet to the west to correspond to the location of prior sample SD-22; and
- SD-32: relocated approximately 200 feet to the west to correspond to the location of MDEQ's x-ray fluorescence (XRF) screening transect T-6.

SOIL AND SEDIMENT SAMPLING PROCEDURES

A copy of the EPA Standard Operating Procedure (SOP) #2016 for sediment sampling is enclosed.

VISIBLY IDENTIFIABLE MOUNDS

As part of the sampling effort, the field team will map visibly identifiable mounds of materials piled on either bank of CD#30. Such mounds, which were previously noted, are primarily located near the north bank of CD#30 east of South Matteson Street and south of CD#30 just west of the Consumers Power substation. The quantities of materials associated with these mounds will be estimated from field measurements and observations.

GROUNDWATER NORTH OF CD#30

The attached table (Table 1) presents the recent (2001 through 2008) data for metals concentrations from sampling of the 16 groundwater monitoring wells located north of CD#30 (Figure 2). As shown in Table 1, none of these measured concentrations in groundwater exceeds either the Site Boundary Criteria (bases on drinking water quality) that were defined in the Record of Decision or the most recent groundwater to surface water interface (GSI) Criteria defined by MDEQ's September 16, 2008 memorandum.

From these data, the Group concludes that the non-erodible soils along CD#30 are not contributing to metals concentrations in groundwater that exceed Site Boundary or GSI Criteria. Accordingly, cleanup goals for these non-erodible soils are unnecessary based on soil-to-groundwater pathways and need only consider direct-contact exposure pathways.

To complement these groundwater data, the Group will, as recommended by MDEQ, conduct leaching tests of selected samples to confirm that the non-erodible soils along CD#30 do not have the potential to adversely affect groundwater. Based on the results of the soil analyses to determine total metals concentrations, the nine samples exhibiting the highest metals levels will be selected and subjected to Synthetic Precipitation Leaching Procedure (SPLP). The SPLP leachate will be analyzed for metals, including hexavalent chromium, and free cyanide.

* * * *

We trust that this correspondence is responsive to the issues raised in our November 6, 2009 conference call. The Group is prepared to initiate the sampling defined in the Work Plan, as modified herein upon receipt of EPA's authorization to proceed. We believe this sampling will improve the understanding of conditions associated with CD#30 and allow for development of an effective Remedial Design.

If you have questions regarding this submittal or related project matters, please do not hesitate to contact me.

Respectfully submitted,



Leo M. Brausch
Project Coordinator

LMB:

cc: Deborah D. Larsen, MDEQ
Charles W. Graff, MDEQ

cc (via email):
NBIA Operable Unit 1 PRP Group Legal Committee
NBIA Operable Unit 1 PRP Group Technical Committee
Clifford S. Yantz, O'Brien & Gere, Inc.

TABLE

Table 1
Recent (2001 - 2008) Groundwater Metals Data for Wells North of CD #30

Constituent	Groundwater Cleanup Goal (µg/L)		MW-6D	MW-6S		MW-11S		MW-12D	
	Boundary Criterion	GSI Criterion	10/16/2008	12/14/2004	10/16/2008	03/25/2001		03/26/2001	
			Total	Total	Total	Dissolved	Total	Dissolved	Total
Aluminum	--	--	1,330	200 U	97 U	20 U	20 U	20 U	20 U
Antimony	--	--	10 U	60 U	1.8 U	60 U	60 U	60 U	60 U
Arsenic	--	160	5 J	10 U	3.2 U	10 U	10 U	10 U	10 U
Barium	--	1,300	87.3 J	74 B	69 J	110 B	110 B	91 B	110 B
Beryllium	--	--	0.46 U	5 U	0.46 U	5 U	5 U	5 U	5 U
Cadmium	5.0	10	0.66 U	5 U	0.66 U	5 U	5 U	0.36 B	5 U
Calcium	--	--	99,200	94,400	76,000	140,000	141,000	133,000	141,000
Chromium (Hexavalent)	11	12	NA	NA	NA	NA	NA	NA	NA
Chromium (Total)	--	260	5.3	10 U	2.2 U	10 U	10 U	10 U	10 U
Cobalt	--	--	7 U	1.4 B	7 U	50 U	50 U	50 U	50 U
Copper	--	32	4.5 U	5.5 B	8.1 J	25 U	25 U	25 U	25 U
Iron	--	--	3,220	100 U	81 U	100 U	100 U	540	100 U
Lead	4.0	140	1.9 U	3 U	1.9 U	3 U	3 U	3 U	3 U
Magnesium	--	--	26,600	19,000	16,900	26,300	26,400	41,200	26,400
Manganese	--	--	129	140	432	1.2 B	25	130	25
Mercury	1.0	--	0.12 U	0.2 U	0.12 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100	140	25 U	12 B	19.9 J	40 U	2.2 B	4.3 B	2.2 B
Potassium	--	--	2,500	3,400 J B	2,740	5,700	5,700	1,200 B	5,700
Selenium	--	--	4.1 U	5 U	4.1 U	5 U	5 U	5 U	5 U
Silver	34	0.064	2.2 U	10 U	2.2 U	10 U	10 U	10 U	10 U
Sodium	--	--	30,900	4,600 B	4,450	144,000	144,000	17,100	16,400
Thallium	--	--	4.7 U	10 U	10 U	10 U	10 U	10 U	10 U
Vanadium	--	--	7 U	50 U	0.64 U	50 U	50 U	50 U	50 U
Zinc	2,400	600	20 U	20 U	20 U	20 U	20 U	20 U	20 U

Table 1
Recent (2001 - 2008) Groundwater Metals Data for Wells North of CD #30

Constituent	Groundwater Cleanup Goal (µg/L)		MW-12S		MW-33I		
	Boundary Criterion	GSI Criterion	03/25/2001		03/26/2001		10/15/2008
			Dissolved	Total	Dissolved	Total	Total
Aluminum	--	--	20 U	20 U	20 U	20 U	207
Antimony	--	--	60 U	60 U	60 U	60 U	1.8 U
Arsenic	--	160	10 U	10 U	10 U	10 U	10 U
Barium	--	1,300	39 B	39 B	66 B	66 B	134
Beryllium	--	--	5 U	5 U	5 U	5 U	0.46 U
Cadmium	5.0	10	5 U	5 U	5 U	5 U	0.66 U
Calcium	--	--	115,000	118,000	74,900	75,000	102,000
Chromium (Hexavalent)	11	12	NA	NA	NA	NA	NA
Chromium (Total)	--	260	10 U	10 U	10 U	10 U	2.2 U
Cobalt	--	--	50 U	50 U	50 U	50 U	1.7 U
Copper	--	32	25 U	25 U	25 U	25 U	4.5 U
Iron	--	--	100 U	100 U	100 U	100 U	442
Lead	4.0	140	3 U	3 U	3 U	3 U	1.9 U
Magnesium	--	--	31,100	31,600	19,200	19,200	27,600
Manganese	--	--	360	350	2.2 B	2.2 B	124
Mercury	1.0	--	0.2 U	0.2 U	0.2 U	0.2 U	0.12 U
Nickel	100	140	2.7 B	3 B	2.8 B	3.2 B	8.4 J
Potassium	--	--	1,200 B	1,200 B	2,700 B	2,600 B	2,850
Selenium	--	--	5 U	5 U	5 U	5 U	4.1 U
Silver	34	0.064	10 U	10 U	10 U	10 U	2.2 U
Sodium	--	--	7,500	7,400	1,600 B	1,600 B	23,500
Thallium	--	--	10 U	10 U	10 U	10 U	4.7 U
Vanadium	--	--	50 U	50 U	50 U	50 U	0.64 U
Zinc	2,400	600	20 U	20 U	20 U	20 U	20 U

Table 1
Recent (2001 - 2008) Groundwater Metals Data for Wells North of CD #30

Constituent	Groundwater Cleanup Goal (µg/L)		MW-33S				MW-35I	
	Boundary Criterion	GSI Criterion	03/26/2001		12/14/2004	10/15/2008	03/23/2001	
			Dissolved	Total	Total	Total	Dissolved	Total
Aluminum	--	--	20 U	20 U	200 U	97 U	20 U	20 U
Antimony	--	--	60 U	60 U	60 U	10 U	60 U	60 U
Arsenic	--	160	10 U	10 U	10 U	3.2 U	10 U	10 U
Barium	--	1,300	110 B	110 B	55 J B	100 U	120 B	120 B
Beryllium	--	--	5 U	5 U	5 U	0.46 U	5 U	5 U
Cadmium	5.0	10	5 U	0.33 B	5 U	0.66 U	5 U	5 U
Calcium	--	--	94,300	94,500	110,000	105,000	146,000	141,000
Chromium (Hexavalent)	11	12	NA	NA	NA	NA	NA	NA
Chromium (Total)	--	260	10 U	10 U	10 U	5.4	10 U	10 U
Cobalt	--	--	50 U	50 U	50 U	1.7 U	50 U	50 U
Copper	--	32	7.9 B	6.9 B	25 U	11.3 J	25 U	25 U
Iron	--	--	100 U	100 U	130	81 U	1,300	1,800
Lead	4.0	140	3 U	3 U	3 U	2 J	3 U	3 U
Magnesium	--	--	19,600	19,900	20,000	17,900	44,600	43,000
Manganese	--	--	10 B	9.9 B	33	42.5	270	260
Mercury	1.0	--	0.2 U	0.2 U	0.2 U	0.12 U	0.2 U	0.2 U
Nickel	100	140	6.3 B	6.2 B	6.8 B	23.4 J	2.3 B	40 U
Potassium	--	--	3,100 B	3,200 B	5,000 U	4,790	1,600 B	1,500 B
Selenium	--	--	8.1	9.9	3.9 B	8.6	5 U	5 U
Silver	34	0.064	10 U	10 U	10 U	2.2 U	10 U	10 U
Sodium	--	--	840 B	850 B	1,100 B	1,750	33,200	32,600
Thallium	--	--	5.8 B	10 U	10 U	4.7 U	10 U	10 U
Vanadium	--	--	50 U	50 U	50 U	0.64 U	50 U	50 U
Zinc	2,400	600	20 U	20 U	20 U	20 U	20 U	20 U

Table 1
Recent (2001 - 2008) Groundwater Metals Data for Wells North of CD #30

Constituent	Groundwater Cleanup Goal (µg/L)		MW-35S		MW-37		
	Boundary Criterion	GSI Criterion	03/23/2001		09/05/2002	12/13/2004	10/13/2008
			Dissolved	Total	Dissolved	Total	Total
Aluminum	--	--	20 U	20 U	20 U	200 U	97 U
Antimony	--	--	60 U	60 U	10 U	60 U	10 U
Arsenic	--	160	10 U	10 U	5.2 B	11	150
Barium	--	1,300	64 B	64 B	75 J	60 B	82 J
Beryllium	--	--	5 U	5 U	5 U	5 U	0.46 U
Cadmium	5.0	10	5 U	5 U	2 U	5 U	0.66 U
Calcium	--	--	86,800	85,900	103,000 J	116,000	114,000
Chromium (Hexavalent)	11	12	NA	NA	NA	NA	NA
Chromium (Total)	--	260	10 U	10 U	5 U	10 U	2.2 U
Cobalt	--	--	50 U	50 U	1.5 B	1.2 B	1.7 U
Copper	--	32	6.3 B	6.5 B	25 U	25 U	22.7 J
Iron	--	--	100 U	100 U	900	1,500	15,700
Lead	4.0	140	3 U	3 U	3 U	3 U	1.9 U
Magnesium	--	--	19,700	19,500	28,600	32,200	32,600
Manganese	--	--	160	160	300	200	317
Mercury	1.0	--	0.15 B	0.2 U	0.2 U	0.2 U	0.12 U
Nickel	100	140	2.6 B	40 U	40 U	40 U	3.2 U
Potassium	--	--	4,200 B	4,200 B	840 J B	5,000 U	498 J
Selenium	--	--	5 U	5 U	5 U	5 U	4.1 U
Silver	34	0.064	10 U	10 U	5 U	10 U	2.2 U
Sodium	--	--	2,700 B	2,600 B	5,000 U	4,500 B	5,660
Thallium	--	--	10 U	10 U	10 U	10 U	10 U
Vanadium	--	--	50 U	50 U	7 U	50 U	0.64 U
Zinc	2,400	600	20 U	20 U	20 U	20 U	26.6

Table 1
Recent (2001 - 2008) Groundwater Metals Data for Wells North of CD #30

Constituent	Groundwater Cleanup Goal (µg/L)		MW-38			MW-43	MW-44D	MW-44S
	Boundary Criterion	GSI Criterion	09/04/2002	12/13/2004	10/13/2008	10/15/2008	10/16/2008	10/15/2008
			Dissolved	Total	Total	Total	Total	Total
Aluminum	--	--	20 U	200 U	97 U	200 U	224	97 U
Antimony	--	--	10 U	60 U	10 U	10 U	1.8 U	10 U
Arsenic	--	160	2.2 B	8 B	8.7 J	10 U	4.8 J	3.2 U
Barium	--	1,300	100 J	91 B J	96.3 J	100 U	68.5 J	100 U
Beryllium	--	--	5 U	5 U	0.46 U	0.46 U	0.46 U	0.46 U
Cadmium	5.0	10	2 U	5 U	0.66 U	0.66 U	0.66 U	0.66 U
Calcium	--	--	99,200 J	102,000	108,000	96,500	99,200	107,000
Chromium (Hexavalent)	11	12	NA	NA	NA	NA	NA	NA
Chromium (Total)	--	260	5 U	10 U	2.2 U	2.2 U	2.2 U	2.2 U
Cobalt	--	--	7 U	1 B	1.7 U	1.7 U	1.7 U	1.7 U
Copper	--	32	25 U	25 U	4.5 U	4.5 U	4.5 U	4.5 U
Iron	--	--	860	1,000	1,110	111	1,180	81 U
Lead	4.0	140	3 U	3 U	1.9 U	1.9 U	1.9 U	1.9 U
Magnesium	--	--	27,600	28,200	30,800	24,300	24,800	25,200
Manganese	--	--	130	160	157	280	100	51.1
Mercury	1.0	--	0.2 U	0.2 U	0.12 U	0.12 U	0.12 U	0.12 U
Nickel	100	140	40 U	40 U	3.2 U	14.9 J	11.8 J	11.8 J
Potassium	--	--	930 J B	5,000 U	908 J	2,040	2,050	1,490
Selenium	--	--	5 U	5 U	4.1 U	4.1 U	4.1 U	4.1 U
Silver	34	0.064	5 U	10 U	2.2 U	2.2 U	2.2 U	2.2 U
Sodium	--	--	5,000 U	3,600 B	4,150	9,890	30,700	14,900
Thallium	--	--	10 U	4.7 B	10 U	10 U	10 U	4.7 U
Vanadium	--	--	7 U	50 U	0.64 U	0.64 U	0.64 U	0.64 U
Zinc	2,400	600	20 U	20 U	20 U	20 U	20 U	20 U

Table 1
Recent (2001 - 2008) Groundwater Metals Data for Wells North of CD #30

Constituent	Groundwater Cleanup Goal (µg/L)		MW-45D	MW-45S
	Boundary Criterion	GSI Criterion	10/16/2008	10/16/2008
			Total	Total
Aluminum	--	--	698	228
Antimony	--	--	1.8 U	1.8 U
Arsenic	--	160	7.3 J	4.1 J
Barium	--	1,300	102	79.2 J
Beryllium	--	--	0.46 U	0.46 U
Cadmium	5.0	10	0.66 U	0.66 U
Calcium	--	--	101,000	101,000
Chromium (Hexavalent)	11	12	NA	NA
Chromium (Total)	--	260	3.2 J	5.2
Cobalt	--	--	1.7 U	1.7 U
Copper	--	32	19 J	9.9 J
Iron	--	--	2,010	731
Lead	4.0	140	1.9 U	1.9 U
Magnesium	--	--	26,300	28,400
Manganese	--	--	130	144
Mercury	1.0	--	0.12 U	0.12 U
Nickel	100	140	6.9 J	16.8 J
Potassium	--	--	2,030	1,620
Selenium	--	--	4.1 U	4.1 U
Silver	34	0.064	2.2 U	2.2 U
Sodium	--	--	34,900	23,900
Thallium	--	--	10 U	10 U
Vanadium	--	--	7 U	7 U
Zinc	2,400	600	20 U	20 U

Table 1
Recent (2001 - 2008) Groundwater Metals Data for Wells North of CD #30

Notes:

1. All concentrations reported in units of micrograms per liter ($\mu\text{g/L}$).
2. Groundwater Cleanup Goals are defined by the following:
 - Boundary Criteria - 1998 Record of Decision (ROD).
 - GSI Criteria - September 16, 2008 MDEQ Memorandum, "Venting Groundwater Mixing Zone Review - Revised."
3. Notes on Groundwater Data:
 - For clarity, all detections are shown in **bold-face** type.
 - "NA" indicates sample not analyzed for this parameter.
4. Data Qualifiers:
 - U - Constituent not detected at indicated Reporting Limit (RL).
 - J - Estimated concentration detected above Minimum Detection Limit (MDL), but below RL.
 - B - Constituent detected in method blank at a reportable concentration.

FIGURES



NORTH BRONSON
INDUSTRIAL AREA SITE
OPERABLE UNIT 1
BRONSON, MICHIGAN

FILE NO. 12716.41845.006
DECEMBER 2009









2007 © O'Brien & Gere Engineers, Inc.

(b) (6)

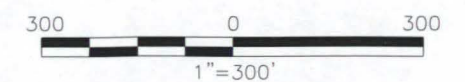
FIGURE 2

LEGEND

- APPROXIMATE SITE BOUNDARY
-  VAP MONITORING WELL LOCATION
-  RI MONITORING WELL
-  PRE-DESIGN MW
-  PIEZOMETER LOCATION AND NUMBER
-  PRIVATE WELL LOCATION
-  SURFACE-WATER FLOW DIRECTION

NORTH BRONSON
INDUSTRIAL AREA SITE
OPERABLE UNIT 1
BRONSON, MICHIGAN

MONITORING WELLS NORTH
OF COUNTY DRAIN #30



FILE NO. 12716.41845.002
DECEMBER 2009



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APPENDIX A
EPA STANDARD OPERATING PROCEDURE #2016
SEDIMENT SAMPLING
REVISION 0.0, NOVEMBER 17, 1994



SEDIMENT SAMPLING

SOP#: 2016
DATE: 11/17/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) is applicable to the collection of representative sediment samples. Analysis of sediment may be biological, chemical, or physical in nature and may be used to determine the following:

- C toxicity;
- C biological availability and effects of contaminants;
- C benthic biota;
- C extent and magnitude of contamination;
- C contaminant migration pathways and source;
- C fate of contaminants;
- C grain size distribution.

The methodologies discussed in this SOP are applicable to the sampling of sediment in both flowing and standing water. They are generic in nature and may be modified in whole or part to meet the handling and analytical requirements of the contaminants of concern, as well as the constraints presented by site conditions and equipment limitations. However, if modifications occur, they should be documented in a site or personal logbook and discussed in reports summarizing field activities and analytical results.

For the purposes of this procedure, sediments are those mineral and organic materials situated beneath an aqueous layer. The aqueous layer may be either static, as in lakes, ponds, and impoundments; or flowing, as in rivers and streams.

Mention of trade names or commercial products does not constitute U.S. EPA endorsement or recommendation for use.

2.0 METHOD SUMMARY

Sediment samples may be collected using a variety of methods and equipment, depending on the depth of the aqueous layer, the portion of the sediment profile

required (surface vs. subsurface), the type of sample required (disturbed vs. undisturbed), contaminants present, and sediment type.

Sediment is collected from beneath an aqueous layer either directly, using a hand held device such as a shovel, trowel, or auger; or indirectly, using a remotely activated device such as an Ekman or Ponar dredge. Following collection, sediment is transferred from the sampling device to a sample container of appropriate size and construction for the analyses requested. If composite sampling techniques are employed, multiple grabs are placed into a container constructed of inert material, homogenized, and transferred to sample containers appropriate for the analyses requested. The homogenization procedure should not be used if sample analysis includes volatile organics; in this case, sediment, or multiple grabs of sediment, should be transferred directly from the sample collection device or homogenization container to the sample container.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

1. Chemical preservation of solids is generally not recommended. Cooling to 4°C is usually the best approach, supplemented by the appropriate holding time for the analyses requested.
2. Wide mouth glass containers with Teflon lined caps are utilized for sediment samples. The sample volume is a function of the analytical requirements and will be specified in the Work Plan.
3. If analysis of sediment from a discrete depth or location is desired, sediment is transferred directly from the sampling device to a labeled sample container(s) of appropriate size and construction for the analyses

requested. Transfer is accomplished with a stainless steel or plastic lab spoon or equivalent.

4. If composite sampling techniques or multiple grabs are employed, equal portions of sediment from each location are deposited into a stainless steel, plastic, or other appropriate composition (e.g., Teflon) containers. The sediment is homogenized thoroughly to obtain a composite representative of the area sampled. The composite sediment sample is transferred to a labeled container(s) of appropriate size and construction for the analyses requested. Transfer of sediment is accomplished with a stainless steel or plastic lab spoon or equivalent. Samples for volatile organic analysis must be transferred directly from the sample collection device or pooled from multiple areas in the homogenization container prior to mixing. This is done to minimize loss of contaminant due to volatilization during homogenization.
5. All sampling devices should be decontaminated, then wrapped in aluminum foil. The sampling device should remain in this wrapping until it is needed. Each sampling device should be used for only one sample. Disposable sampling devices for sediment are generally impractical due to cost and the large number of sediment samples which may be required. Sampling devices should be cleaned in the field using the decontamination procedure described in the Sampling Equipment Decontamination SOP.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Substrate particle size and organic matter content are a direct consequence of the flow characteristics of a waterbody. Contaminants are more likely to be concentrated in sediments typified by fine particle size and a high organic matter content. This type of sediment is most likely to be collected from depositional zones. In contrast, coarse sediments with low organic matter content do not typically concentrate pollutants and are generally found in erosional zones. The selection of a sampling location

can, therefore, greatly influence the analytical results and should be justified and specified in the Work Plan.

5.0 EQUIPMENT/APPARATUS

Equipment needed for collection of sediment samples may include:

- C Maps/plot plan
- C Safety equipment
- C Compass
- C Tape measure
- C Survey stakes, flags, or buoys and anchors
- C Camera and film
- C Stainless steel, plastic, or other appropriate composition bucket
- C 4-oz., 8-oz., and one-quart wide mouth jars w/Teflon lined lids
- C Ziploc plastic bags
- C Logbook
- C Sample jar labels
- C Chain of Custody records, field data sheets
- C Cooler(s)
- C Ice
- C Decontamination supplies/equipment
- C Spade or shovel
- C Spatula
- C Scoop
- C Trowel
- C Bucket auger
- C Tube auger
- C Extension rods
- C "T" handle
- C Sediment coring device (tube, drive head, eggshell check valve, nosecone, acetate tube, extension rods, "T" handle)
- C Ponar dredge
- C Ekman dredge
- C Nylon rope or steel cable
- C Messenger device

6.0 REAGENTS

Reagents are not used for preservation of sediment samples. Decontamination solutions are specified in the Sampling Equipment Decontamination SOP.

7.0 PROCEDURES

7.1 Preparation

1. Determine the objective(s) and extent of the sampling effort. The sampling methods to be employed, and the types and amounts of equipment and supplies required will be a function of site characteristics and objectives of the study.
2. Obtain the necessary sampling and monitoring equipment.
3. Prepare schedules, and coordinate with staff, client, and regulatory agencies, if appropriate.
4. Decontaminate or preclean equipment, and ensure that it is in working order.
5. Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.
6. Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors including flow regime, basin morphometry, sediment characteristics, depth of overlying aqueous layer, contaminant source, and extent and nature of contamination should be considered when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Sample Collection

Selection of a sampling device is most often contingent upon: (1) the depth of water at the sampling location, and (2) the physical characteristics of the sediment to be sampled. The following procedures may be utilized:

7.2.1 Sampling Surface Sediment with a Trowel or Scoop from Beneath a Shallow Aqueous Layer

For the purpose of this method, surface sediment is considered to range from 0 to six inches in depth and

a shallow aqueous layer is considered to range from 0 to 12 inches in depth. Collection of surface sediment from beneath a shallow aqueous layer can be accomplished with tools such as spades, shovels, trowels, and scoops. Although this method can be used to collect both unconsolidated/consolidated sediment, it is limited somewhat by the depth and movement of the aqueous layer. Deep and rapidly flowing water render this method less accurate than others discussed below. However, representative samples can be collected with this procedure in shallow sluggish water provided care is demonstrated by the sample team member. A stainless steel or plastic sampling implement will suffice in most applications. Care should be exercised to avoid the use of devices plated with chrome or other materials; plating is particularly common with garden trowels.

The following procedure will be used to collect sediment with a scoop, shovel, or trowel:

1. Using a decontaminated sampling implement, remove the desired thickness and volume of sediment from the sampling area.
2. Transfer the sample into an appropriate sample or homogenization container. Ensure that non-dedicated containers have been adequately decontaminated.
3. Surface water should be decanted from the sample or homogenization container prior to sealing or transfer; care should be taken to retain the fine sediment fraction during this procedure.

7.2.2 Sampling Surface Sediment with a Bucket Auger or Tube Auger from Beneath a Shallow Aqueous Layer

For the purpose of this method, surface sediment is considered to range from 0 to six inches in depth and a shallow aqueous layer is considered to range from 0 to 24 inches in depth. Collection of surface sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of bucket auger or tube auger, a series of extensions, and a "T" handle (Figure 1, Appendix A). The use of additional extensions in conjunction with a bucket auger can increase the depth of water from which sediment can be collected from 24 inches to 10 feet or more. However, sample handling and manipulation increases

in difficulty with increasing depth of water. The bucket auger or tube auger is driven into the sediment and used to extract a core. The various depths represented by the core are homogenized or a subsample of the core is taken from the appropriate depth.

The following procedure will be used to collect sediment samples with a bucket auger or tube auger:

1. An acetate core may be inserted into the bucket auger or tube auger prior to sampling if characteristics of the sediments or waterbody warrant. By using this technique, an intact core can be extracted.
2. Attach the auger head to the required length of extensions, then attach the "T" handle to the upper extension.
3. Clear the area to be sampled of any surface debris.
4. Insert the bucket auger or tube auger into the sediment at a 0° to 20° angle from vertical. This orientation minimizes spillage of the sample from the sampler upon extraction from the sediment and water.
5. Rotate the auger to cut a core of sediment.
6. Slowly withdraw the auger; if using a tube auger, make sure that the slot is facing upward.
7. Transfer the sample or a specified aliquot of sample into an appropriate sample or homogenization container. Ensure that non-dedicated containers have been adequately decontaminated.

7.2.3 Sampling Deep Sediment with a Bucket Auger or Tube Auger from Beneath a Shallow Aqueous Layer

For the purpose of this method, deep sediment is considered to range from six to greater than 18 inches in depth and a shallow aqueous layer is considered to range from 0 to 24 inches. Collection of deep sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of a bucket auger, a tube auger, a series of extensions and a

"T" handle. The use of additional extensions can increase the depth of water from which sediment can be collected from 24 inches to five feet or more. However, water clarity must be high enough to permit the sampler to directly observe the sampling operation. In addition, sample handling and manipulation increases in difficulty with increasing depth of water. The bucket auger is used to bore a hole to the upper range of the desired sampling depth and then withdrawn. The tube auger is then lowered down the borehole, and driven into the sediment to the lower range of the desired sampling depth. The tube is then withdrawn and the sample recovered from the tube. This method can be used to collect firmly consolidated sediments, but is somewhat limited by the depth of the aqueous layer, and the integrity of the initial borehole.

The following procedure will be used to collect deep sediment samples with a bucket auger and a tube auger:

1. Attach the bucket auger bit to the required lengths of extensions, then attach the "T" handle to the upper extension.
2. Clear the area to be sampled of any surface debris.
3. Begin augering, periodically removing any accumulated sediment (i.e., cuttings) from the auger bucket. Cuttings should be disposed of far enough from the sampling area to minimize cross contamination of various depths.
4. After reaching the upper range of the desired depth, slowly and carefully remove bucket auger from the boring.
5. Attach the tube auger bit to the required lengths of extensions, then attach the "T" handle to the upper extension.
6. Carefully lower tube auger down borehole using care to avoid making contact with the borehole sides and, thus, cross contaminating the sample. Gradually force tube auger into sediment to the lower range of the desired sampling depth. Hammering of the tube auger to facilitate coring should be avoided as the vibrations may cause the boring walls

to collapse.

7. Remove tube auger from the borehole, again taking care to avoid making contact with the borehole sides and, thus, cross contaminating the sample.
8. Discard the top of core (approximately 1 inch); as this represents material collected by the tube auger before penetration to the layer of concern.
9. Transfer sample into an appropriate sample or homogenization container. Ensure that non-dedicated containers have been adequately decontaminated.

7.2.4 Sampling Surface Sediment with an Ekman or Ponar Dredge from Beneath a Shallow or Deep Aqueous Layer

For the purpose of this method, surface sediment is considered to range from 0 to six inches in depth. Collection of surface sediment can be accomplished with a system consisting of a remotely activated device (dredge) and a deployment system. This technique consists of lowering a sampling device (dredge) to the surface of the sediment by use of a rope, cable, or extended handle. The mechanism is activated, and the device entraps sediment in spring loaded or lever operated jaws.

An Ekman dredge is a lightweight sediment sampling device with spring activated jaws. It is used to collect moderately consolidated, fine textured sediment. The following procedure will be used for collecting sediment with an Ekman dredge (Figure 2, Appendix A):

1. Attach a sturdy nylon rope or stainless steel cable through the hole on the top of the bracket, or secure the extension handle to the bracket with machine bolts.
2. Attach springs to both sides of the jaws. Fix the jaws so that they are in open position by placing trip cables over the release studs. Ensure that the hinged doors on the dredge top are free to open.
3. Lower the sampler to a point 4 to 6 inches

above the sediment surface.

4. Drop the sampler to the sediment.
5. Trigger the jaw release mechanism by lowering a messenger down the line, or by depressing the button on the upper end of the extension handle.
6. Raise the sampler and slowly decant any free liquid through the top of the sampler. Care should be taken to retain the fine sediment fraction during this procedure.
7. Open the dredge jaws and transfer the sample into a stainless steel, plastic or other appropriate composition (e.g., Teflon) container. Ensure that non-dedicated containers have been adequately decontaminated. If necessary, continue to collect additional sediment grabs until sufficient material has been secured to fulfill analytical requirements. Thoroughly homogenize and then transfer sediment to sample containers appropriate for the analyses requested. Samples for volatile organic analysis must be collected directly from the bucket before homogenization to minimize volatilization of contaminants.

A Ponar dredge is a heavyweight sediment sampling device with weighted jaws that are lever or spring activated. It is used to collect consolidated fine to coarse textured sediment. The following procedure will be used for collecting sediment with a Ponar dredge (Figure 3, Appendix A):

1. Attach a sturdy nylon rope or steel cable to the ring provided on top of the dredge.
2. Arrange the Ponar dredge with the jaws in the open position, setting the trip bar so the sampler remains open when lifted from the top. If the dredge is so equipped, place the spring loaded pin into the aligned holes in the trip bar.
3. Slowly lower the sampler to a point approximately two inches above the sediment.
4. Drop the sampler to the sediment. Slack on

the line will release the trip bar or spring loaded pin; pull up sharply on the line closing the dredge.

5. Raise the dredge to the surface and slowly decant any free liquid through the screens on top of the dredge. Care should be taken to retain the fine sediment fraction during this operation.
6. Open the dredge and transfer the sediment to a stainless steel, plastic or other appropriate composition (e.g., Teflon) container. Ensure that non-dedicated containers have been adequately decontaminated. If necessary, continue to collect additional sediment until sufficient material has been secured to fulfill analytical requirements. Thoroughly homogenized and then transfer sediment to sample containers appropriate for the analyses requested. Samples for volatile organic analysis must be collected directly from the bucket before homogenization to minimize volatilization of contaminants.

7.2.5 Sampling Subsurface Sediment with a Coring Device from Beneath a Shallow Aqueous Layer

For purposes of this method, subsurface sediment is considered to range from 6 to 24 inches in depth and a shallow aqueous layer is considered to range from 0 to 24 inches in depth. Collection of subsurface sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of a tube sampler, acetate tube, eggshell check valve, nosecone, extensions, and "T" handle, or drivehead. The use of additional extensions can increase the depth of water from which sediment can be collected from 24 inches to 10 feet or more. This sampler may be used with either a drive hammer for firm sediment, or a "T" handle for soft sediment. However, sample handling and manipulation increases in difficulty with increasing depth of water.

The following procedure describes the use of a sample coring device (Figure 4, Appendix A) used to collect subsurface sediments.

1. Assemble the coring device by inserting the acetate core into the sampling tube.
2. Insert the "egg shell" check valve into the lower end of the sampling tube with the convex surface positioned inside the acetate core.
3. Screw the nosecone onto the lower end of the sampling tube, securing the acetate tube and eggshell check valve.
4. Screw the handle onto the upper end of the sampling tube and add extension rods as needed.
5. Place the sampler in a perpendicular position on the sediment to be sampled.
6. If the "T" handle is used, place downward pressure on the device until the desired depth is reached. After the desired depth is reached, rotate the sampler to shear off the core at the bottom. Slowly withdraw the sampler from the sediment and proceed to Step 15.
7. If the drive hammer is selected, insert the tapered handle (drive head) of the drive hammer through the drive head.
8. Drive the sampler into the sediment to the desired depth.
9. Record the length of the tube that penetrated the sample material, and the number of blows required to obtain this depth.
10. Remove the drive hammer and fit the keyhole-like opening on the flat side of the hammer onto the drive head. In this position, the hammer serves as a handle for the sampler.
11. Rotate the sampler to shear off the core at the bottom.
12. Lower the sampler handle (hammer) until it just clears the two ear-like protrusions on the drive head, and rotate about 90°.
13. Slowly withdraw the sampler from the sediment. If the drivehead was used, pull the hammer upwards and dislodge the sampler from the sediment.

14. Carefully remove the coring device from the water.
15. Unscrew the nosecone and remove the eggshell check valve.
16. Slide the acetate core out of the sampler tube. Decant surface water, using care to retain the fine sediment fraction. If head space is present in the upper end, a hacksaw may be used to shear the acetate tube off at the sediment surface. The acetate core may then be capped at both ends. Indicate on the acetate tube the appropriate orientation of the sediment core using a waterproof marker. The sample may be used in this fashion, or the contents transferred to a sample or homogenization container.
17. Open the acetate tube and transfer the sediment to a stainless steel, plastic or other appropriate composition (e.g., Teflon) container. Ensure that non-dedicated containers have been adequately decontaminated. If necessary, continue to collect additional sediment until sufficient material has been secured to fulfill analytical requirements. Thoroughly homogenize and then transfer sediment to sample containers appropriate for the analyses requested. Samples for volatile organic analysis must be collected directly from the bucket before homogenization to minimize volatilization of contaminants.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

There are no specific quality assurance (QA) activities which apply to the implementation of these procedures. However, the following QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA/OSHA and Corporate health and safety procedures.

More specifically, when sampling sediment from waterbodies, physical hazards must be identified and adequate precautions must be taken to ensure the safety of the sampling team. The team member collecting the sample should not get too close to the edge of the waterbody, where bank failure may cause loss of balance. To prevent this, the person performing the sampling should be on a lifeline, and be wearing adequate protective equipment. If sampling from a vessel is determined to be necessary, appropriate protective measures must be implemented.

12.0 REFERENCES

Mason, B.J., Preparation of Soil Sampling Protocol: Technique and Strategies. 1983 EPA-600/4-83-020.

Barth, D.S. and B.J. Mason, Soil Sampling Quality Assurance User's Guide. 1984 EPA-600/4-84-043.

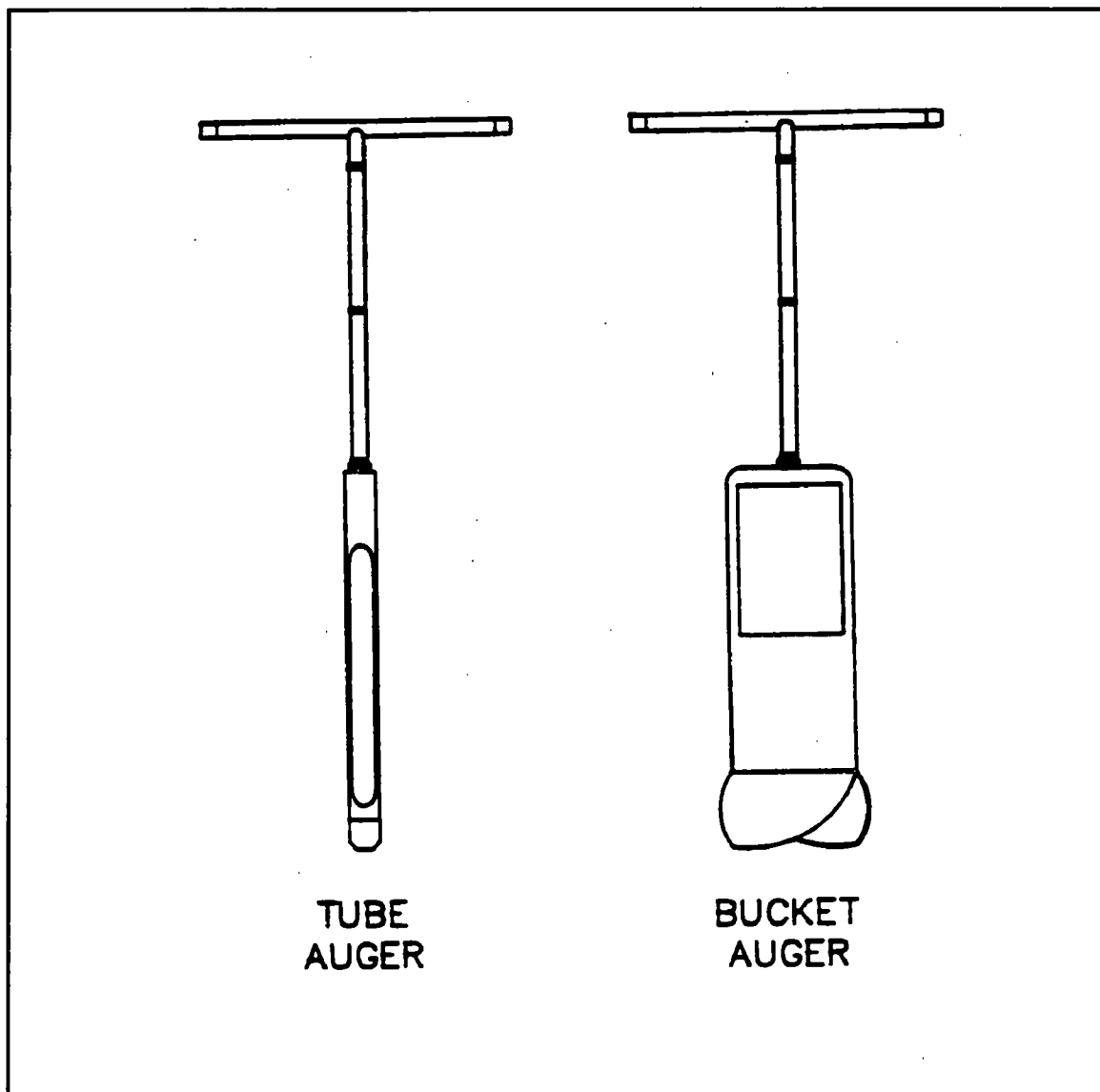
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APPENDIX A

Figures

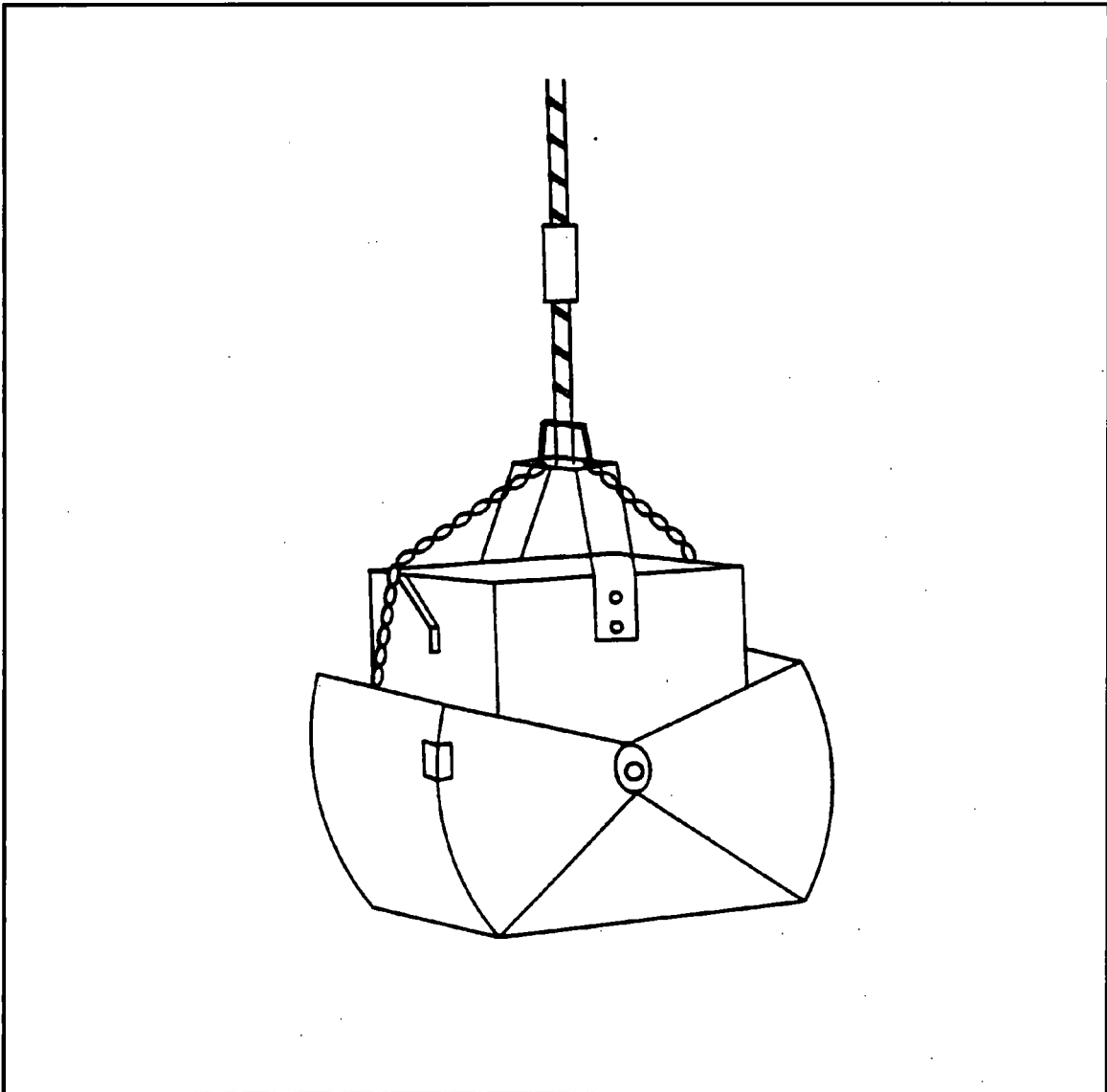
FIGURE 1. Sampling Auger



APPENDIX A (Cont'd)

Figures

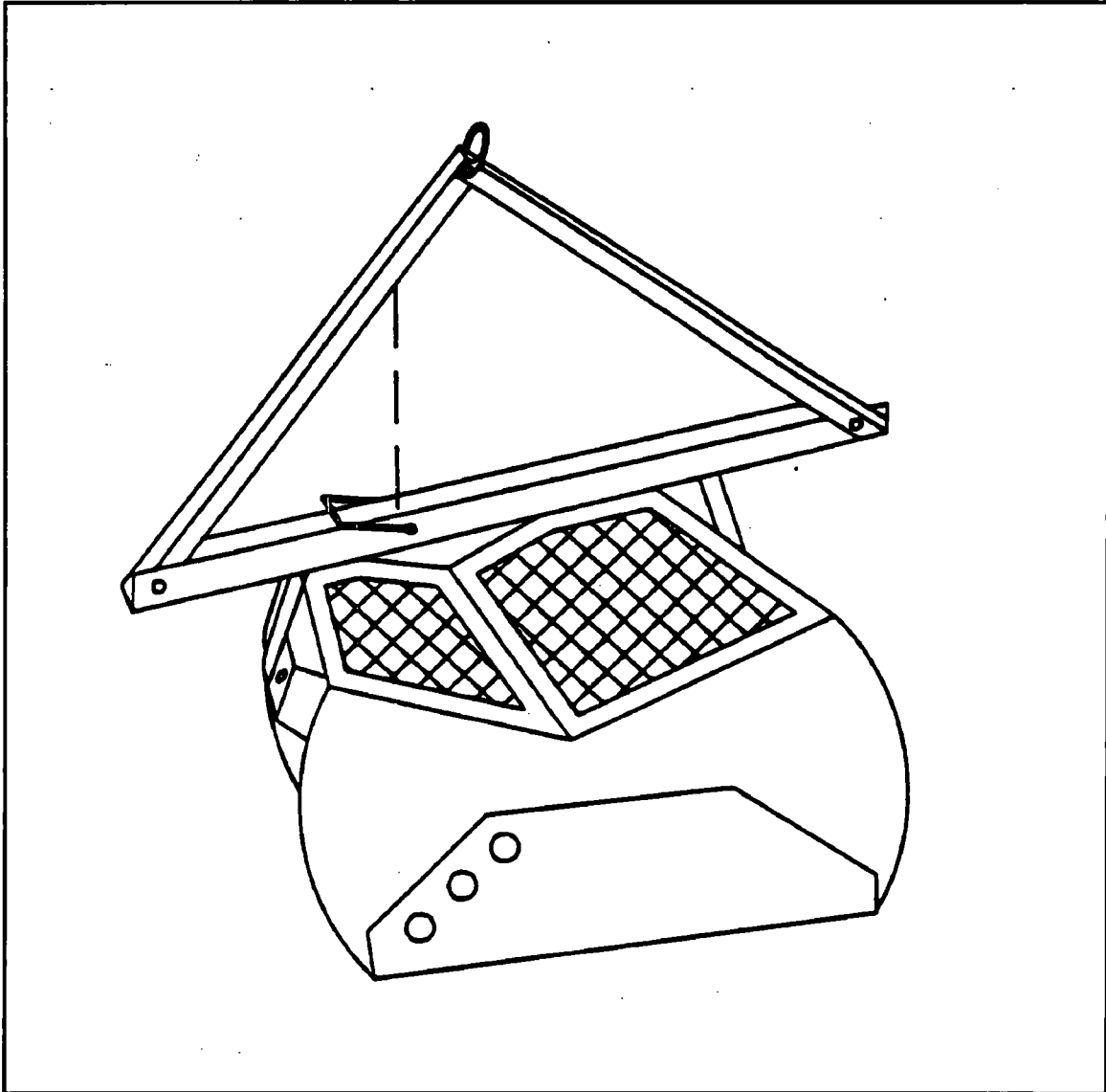
FIGURE 2. Ekman Dredge



APPENDIX A (Cont'd)

Figures

FIGURE 3. Ponar Dredge



APPENDIX A (Cont'd)

Figures

FIGURE 4. Sample Coring Device

